Tube Collectors Association
Special Publication No. 14

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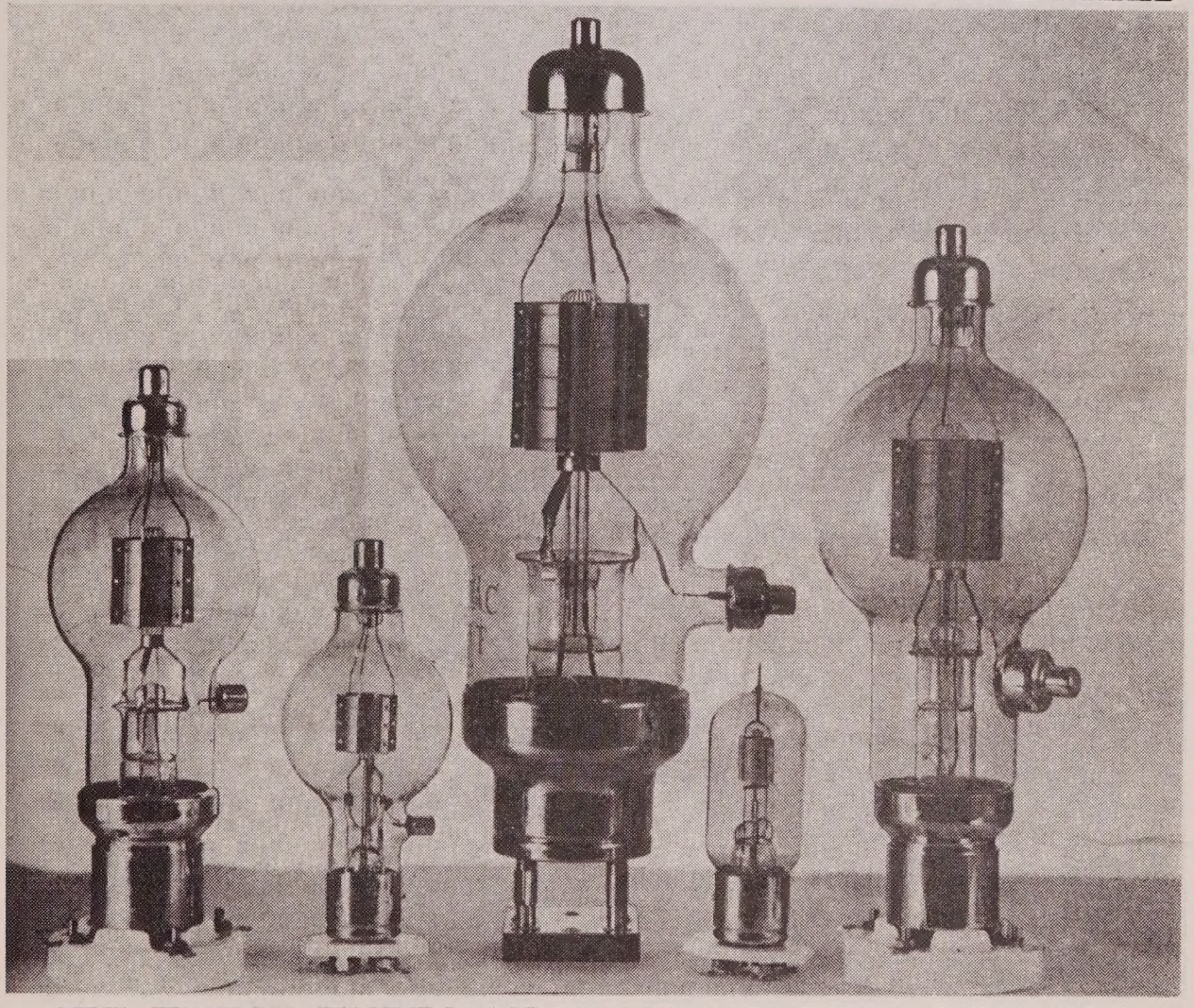

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EIMAC 35T
35 watts plate dissipation
Net price $8.00

EIMAC 50T
75 watt plate dissipation
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EIMAC 150T
150 watts plate dissipation
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300 watt plate dissipation
Net price $60.00

EIMAC 500T
500 watts plate dissipation
Net price $175.00

EITEL-McCULLOUGH, INC.

SAN BRUNO, CALIFORNIA
U. S. A.

CABLE "EIMAC"

TCA Special Publication No. 14

August 2008

Produced by:

Tube Collectors Association, Inc.
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USA

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FRONT COVER: Eimac whole-line advertisement in *Radio*, April 1936.

This publication is dedicated to the late Lane Upton, Salt Lake City Eimacer, TCA "Ace Author," and a well respected and knowledgeable individual generally.

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EIMAC'S MAGIC BOOKS

Ludwell Sibley

INTRODUCTION

In the patent-department files in the Perham-Eimac archive [1] are two old-fashioned ledger books, of the cloth-covered style with prenumbered pages. Labeled "Raytheon Royalty Book," they carry hand-written notations of about 6000 tube sales. The time span is from July 1, 1936 to March 18, 1941, when a notation cheerfully announces "Patent Runs Out."

Eitel-McCullough was paying the Raytheon Production Corporation 1% of sales for rights under a patent [2, 3] for machinery to form the glass base stems of tubes. The initial sales being scored were of vacuum capacitors, 50Ts, 150Ts, 300Ts, and 500Ts. Initially the various types were recorded individually. Later all were lumped together, but since the price for each sale is listed, it is possible to recover the quantities type-by-type. (There is no attempt to distinguish the high-mu TH variants from the low-mu TLs.) For each transaction, there is a date, an abbreviated buyer name, location, quantity, and total price.

By April, 1938, the record was re-expanded to individual types, returning to "VC," 100T, 250T, 450T, and 750T. (Sales of the 1000UHF, and of the 1500T and 2000T after their introduction the next year, were rare enough to be written in separately.) Several tube types (the 35T, UH50, UH51, 75T, 152T, and 304T triodes, various military all-glass radar triodes of 1940 and later, and the RX21 and KY21 types), did not fall under the requirement for the base-machine license. However, most of these were low-runners and / or late arrivals.

In May 1938 the design of the vacuum capacitors was changed so as not to use the patent. The 1500T and 2000T were modified similarly in May 1939.

This record gives a remarkable look into the functioning of this firm, starting only two years after its start. To give a quick summary, here's how the sales add up:

YEAR	TUBES	SALES
3Q36	442	$8309
4Q36	755	12,161
1936	**2394**	**40,940**
1Q37	1123	15,703
2Q37	1236	20,185
3Q37	756	14,318
4Q37	1256	20,913
1937	**4371**	**71,119**
1Q38	1160	15,577
2Q38	959	16,441
3Q38	966	17,344
4Q38	1074	18,853
1938	**4159**	**68,245**
1Q39	881	18,211
2Q39	915	20,720
3Q39	1183	25,861
4Q39	1203	24,233
1939	**4187**	**89,025**
1Q40	869	19,836
2Q40	1010	28,295
3Q40	1036	28,139
4Q40	1753	42,157
1940	**4668**	**118,427**
*1Q41	1966	$47,040

* Extrapolated to account for March 18-31.

Note that these figures are "tubes," not "thousands of tubes," and "dollars," not "thousands of dollars." (To convert to present-day currency, multiply by about 15.) The company was apparently holding its own, but there was essentially no growth in tubes sold until the defense buildup of late 1940 and later. There is a hopeful trend in the dollar figures: as the bigger, higher-valued tubes began to sell, the revenue per unit began to climb.

For 1940 and later the sales tallies omit vacuum capacitors, which were modest in terms of numbers and revenue. They are a little misleading, as sales of 1500Ts and 2000Ts were no longer logged after Dec. 1939. So there is some under-reporting . . . but this is the best we have.

Eimac headquarters, ca. 1939. The pipe masts support wire antennas. The company started at 505 San Mateo Ave., moved in 1936 to 592. At the start of 1940 the number had changed to 770; then by July to 788. There appears to be only a single telephone line entering the building.

Photo: Mike Bach

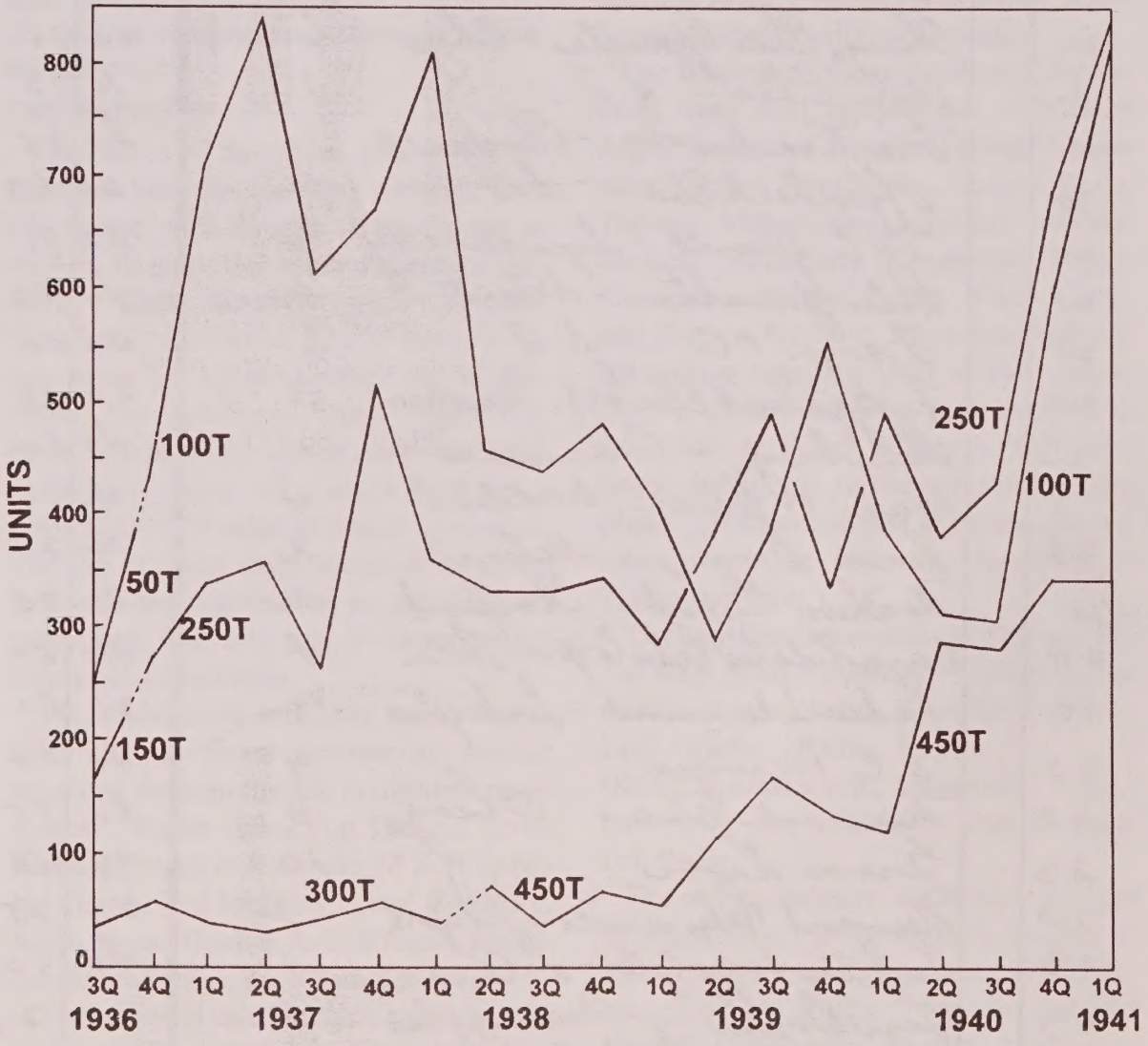
Municipal Railway streetcar on the San Francisco - San Mateo route, passing through San Bruno ca. 1940. The building at extreme left is an Eimac facility.

Photo: D. Shoecraft, The History of San Bruno - The Crossroads Community (San Bruno, CA, San Bruno 75th Anniversary Committee, 1989).

UNIT SALES

The graph below tracks sales of the main product line: the 50T, 150T, and 300T. The 50T was redesigned into the 100T in December 1936, priced the same. The 150T became the 250T at the same time. The 300T became the 450T in April-May 1938.

The remarkable thing about 100T sales is how they tumbled in 1938-40. RCA introduced the 805 triode in 1936 and the 810 in 1938. Both of these offered 25% more plate dissipation than the 100T at a roughly comparable price. There was ample pressure from the other manufacturers. Taylor Tubes, for example, claimed in advertisements to have sold 45,000 tubes in 1937 (including rectifiers), versus only a bit above 4000 for Eimac.



The cure for the competitive problem seems to have been to move upscale power-wise. Tubes like the 450T and 750T were unsuited to the amateur market, but were excellent for airline ground-to-air purposes. Designs like the 1500T and 2000T came along just in time for the emerging FM broadcast industry. By the late '40s, Eimac was vigorously developing whole new product lines, while Taylor Tubes more or less vegetated.

MARKET SECTORS

It is informative to calculate the variation of total sales from one set of customers versus time. Here is the percentage distribution of sales for three representative quarters. Defense-equipment makers and the export trade quickly gained importance.

July 1936 — Type 50T

Date	Name & address	No.	Invoiced	Price
15	Standard Radio Parts. Dayton O	1	10	13
23	Strauss Frank – Houston Tex	6	60	75
15	Conestoga Elec. Lancaster Pa	1	10	13
20	Chicago Radio Apparatus – Chgo	6	60	75
16	Ace Elec – S.F.	1	10	13
15	Winterradio Inc – Cleveland O	2	20	25
20	Offenbach Elec – S.F.	5	50	63
20	W E Berndt – Syracuse NY	2	22	95
20	Radio Specialties – Detroit	4	40	50
20	Fraga & Co – S.F.	6	56	70
20	Fitzpatrick Elec. Sup. Muskegon	3	30	38
23	Steinberg – Cedcommatti	4	40	50
1	Dejay & Hare – Oakland	4	40	50
~~23~~	Rasar Bros – Detroit	2	20	25
20	Northern Ohio Lab – Cleveland	2	20	25
20	Consolidated Radio Corp – Phila	4	40	50
20	Radio Television – Los Angeles	12	121	50
23	E C Wenger	4	40	50
23	Newark Elec – Chicago	6	60	75
23	Gross Radio – N.Y.	10	94	50
23	Newport Radio Service – Norfolk	2	20	25
23	Radio Supply Co – L.A.	4	40	50
23	Lew Bonn – Minneapolis	2	20	25
23	Electronic Spec. Co – Sturgis	4	40	50
28	Radio Supply Inc – Salt Lake City	2	20	25
28	Radio Supply – LA	6	60	75
23	Standard Radio Parts – Dayton	1	10	13
31	Fragos – S.F.	2	18	90
23	Radio Research – Oakland	1	10	13
28	Ace Elec Co – S.F.	1	10	13
		110	1104	34

First page in the ledger

Buyers	1Q37	1Q39	1Q41
Individuals (A)	13.1%	10.3%	2.7%
Operating agencies (B)	0.7	1.3	7.3
OEMs (C)	12.6	13.5	53.8
Researchers / developers	0.7	4.7	2.7
Distributors	67.5	61.4	9.2
Export	5.4	8.8	24.3

(A) Mainly amateurs and amateur clubs
(B) CAA, broadcasters, municipalities, airlines, radio communication companies
(C) Original equipment manufacturers (including diathermy)

THE BUYERS

The names of customers give a fine insight into how this company worked. First off, Eimac sold directly to customers as well as through the usual distributor network. Radio amateurs got a discount. Some sales were to local radio-amateur associations, for either members' or club stations. The distributors didn't usually buy in bulk; a purchase of ten units was large in the early years. As a result there was a huge volume of sales of one or two tubes. The use of direct sales results in competition with the distributors, an awkward arrangement, but this was a startup under Depression conditions.

The distributors were the whole spectrum of the time, familiar to anyone browsing through the ads in old-time magazines: Walter Ashe, Fort Orange, Gross Radio, Herbach & Rademan, M & H Sporting Goods, Ted McElroy, Leo J. Meyberg, Radio Shack, Thurow, E. C. Wenger, Wholesale Radio Service, Zack Radio, and so on.

The recorded sales include exports. The name "Frazar" occurs routinely, specifically Frazar & Co. of San Francisco, Eimac's export agent.

Numerous classes of customers emerge from the buyer list. There were the radio stations, using the tubes either in (smallish) main transmitters or in remote-pickup systems. These included Arizona Broadcasting, Eagle Broadcasting, KDON, KEVO, KLBM, KLRA, KNX, KPQ, KVOA, WDEL, WEEU, WENY, WGN, WGTM, WOKO, WSM, WSVA, WTAX, and XEMO. The Federal Communications Commission at the time published a list of specific tubes that were type-accepted for use in the final amplifiers of AM transmitters. Eimac had gotten its whole line of tubes on the list ca. 1936, and added new types as they appeared. Taylor Tubes eventually did so also. Some of the Eimac-user stations, particularly the smaller ones, probably had "composite" (locally built) transmitters.

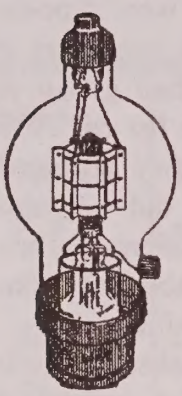
The medical diathermy makers / distributors were well represented, what with Argus Surgical, California Therapy Equipment, Electro Ultra Violet, General Radio Therapy, Magnatherm, Medisco, National Medical, Physicians' Equipment, Physio Therapists, Sanitex, Short Wave Corp., and Therapy Products. Numerous individual doctors bought a 100T or two, apparently as replacements for their equipment. Even Lee de Forest bought a 100T, this being during his diathermy-development phase. (His commercial diathermies used tubes from the likes of Amperex or United, however.)

The smaller transmitter makers of the day were good customers: Collins Radio, Galvin, Gates Radio, Kaar Engineering, Link Radio, Radio Engineering Labs (REL), Techna Corp., Transmitter Equipment Mfg. Co. (TEMCO), and Wunderlich Radio.

The airline industry, or at least the part of it that wasn't using Western Electric or RCA ground transmitters, was a big buyer, especially of 450Ts. Names included Braniff, Continental, Eastern, Northwest, Pan American, Penn Central, and United. The biggest consumer was Transcontinental and Western Airlines (later, TWA), which absorbed a total of 265 450Ts.

The police-radio community was visible too, via orders from the City of Beaumont, City of Birmingham, City of Charlotte, City of El Paso, and City of San Francisco.

Developers of new technology are visible by their tube purchases. Major Edwin Armstrong is discussed below. Zenith



EITEL-McCULLOUGH, INC.

VACUUM TUBES

San Bruno, California

TO: RAYTHEON PRODUCTION CORP
55 Chapel St.
Newton, Mass.

July 15, 1937

REPORT FOR QUARTER ENDING JUNE 30, 1937

Tubes sold under our License Agreement

APRIL, MAY & JUNE

1236 Tubes, price as invoiced $20,165.02

1% - 201.65

EITEL-McCULLOUGH INC.
By:

J. A. McCullough

RD

"Compare and Reflect"

Typical quarterly report to Raytheon

Radio was a major buyer of 1000UHFs; their experimental FM station W9XZR used a pair (later 1500Ts). Early independent TV experimenters - the Don Lee Network in Los Angeles, Balaban & Katz in Chicago, Philco in Philadelphia - bought the bigger Eimac products. The name "Farnsworth" appears consistently, specifically the Farnsworth Television and Radio Corp., which advertised itself as making TV transmitters.

There was a special relationship between Major Armstrong and Eimac. Armstrong had been buying a goodly number of tubes at list price. A letter in the files from him to Eimac asks for a discount. Notes on the letter attest to discussion between "Bill and Jack" and a decision to grant the discount. This turned out to be good for business in the long run. Armstrong had great influence on the development of transmitters at REL, which "designed in" Eimac tubes. Eimac, in turn, featured REL transmitters in its advertising in the radio-engineering press. A June 1937 ad in *Radio* shows a well built amateur transmitter, the property of Charles Srebroff, W2BHY, chief engineer of REL (100THs modulated by 100THs). Beyond that, the basic decision to develop the 1500T and 2000T may have been encouraged by discussions with REL.

It may be well to discuss the Eimac-Armstrong relationship in later times. In developing his prototype AN/CPS-6 VHF-FM radar, "the Major" used Eimac-designed 6C21s. Converted to pulse operation, this set figured in the 1946 Signal Corps moon-radar experiment. Records in the files [4] indicate that in 1945 Armstrong was interested in an early external-anode tube, the X-342 (prototype of the 3X2500A). A telegram from Bill Eitel from 1945 advises "we believe you can get one kW at 200 mc from four 4-125A tetrodes," and there is evidence that Armstrong had had X-103s (4-125A prototypes) in 1944. As late as 1951 he was doing development on a 2.5-kW, 400-MHz transmitter using a developmental Eimac triode, the XMT (X-486).

Some independent radio communication companies were Eimac clients. Press Wireless was a regular buyer on the listing, eventually graduating to 2000Ts. Tropical Radio Telegraph occasionally appears.

The record book ends just as business "caught fire." Export orders ballooned just after the Battle of Britain, totaling 485-100Ts, 586-250Ts, and 50 450Ts. In the fourth quarter of 1940 and first quarter of 1941, bulk orders started to come in regularly from defense contractors. Western Electric entered orders about every three weeks, for 40 250Ts each. By March, 18, there were cumulative totals of 354-100Ts for RCA; 180-450Ts for Westinghouse; 44-100Ts and 19-250Ts for Federal; and so on. Significantly, on the last day of the record book, Eimac's biggest-ever single order came: Westinghouse wanted 80 450Ts for $4500.

It was time to add a second and a third shift at San Bruno, and set up the new plant - beyond the reach of Japanese aviation - at Salt Lake City. But that's another story [5].

ACKNOWLEDGEMENTS

. To History San Jose and Will Jensby, W0EOM, for arranging for loan of the archive. To David Kraeuter, for a copy of the Wise patent. To Pete Grave, for information on the RME transmitter (below).

REFERENCES

1. "Raytheon Production Corp." file, in Perham-Eimac Archive, a holding of History San Jose.

2. "Stem Making Machine," U. S. Pat 1,486,940, issued to Nathan Wise on March 18, 1924 and assigned to Raytheon.

3. "License Agreement Between Raytheon Production Corporation and Eitel-McCullough, July 1, 1936," location as for [1].

4. "Major Armstrong" file, location as for [1].

5. L. Upton, "History of Eimac / Varian Facility in Salt Lake City, 1942 to 2006," *Tube Collector*, Dec. 2006, pp. 20-27.

SOME IMPORTANT AMATEUR-RADIO CUSTOMERS

I recall visiting the Eitel-McCullough company, which I'd learned about through my ham radio activity. I was one of the early purchasers of their tubes, and I shall never forget my visit to San Bruno, which was the old original Eimac factory. These guys were really cogent. The front part of the store had a ham radio station in it, and the back part was the factory. Those of us who had our ham tickets could go in and operate their station, and it was operated with such an overload on the tubes that every time you pressed the key to transmit a dot or a dash the anode to the tube would visibly light up! Going from red to white, if you will, or red from yellow to white! I'd never seen tubes operated in that manner before, but I was really impressed. It was clear that they were having a wonderfully good time doing this, and I just had never seen anything like it anywhere in my contacts on the east coast. - Oswald "Mike" Villard, W6QYT.

Reprinted, with permission, from "Oswald G. Villard, Electrical Engineer, an oral history conducted in 1984 by A. Michal McMahon," IEEE History Center, Rutgers University, New Brunswick, NJ (c) 2004 IEEE.

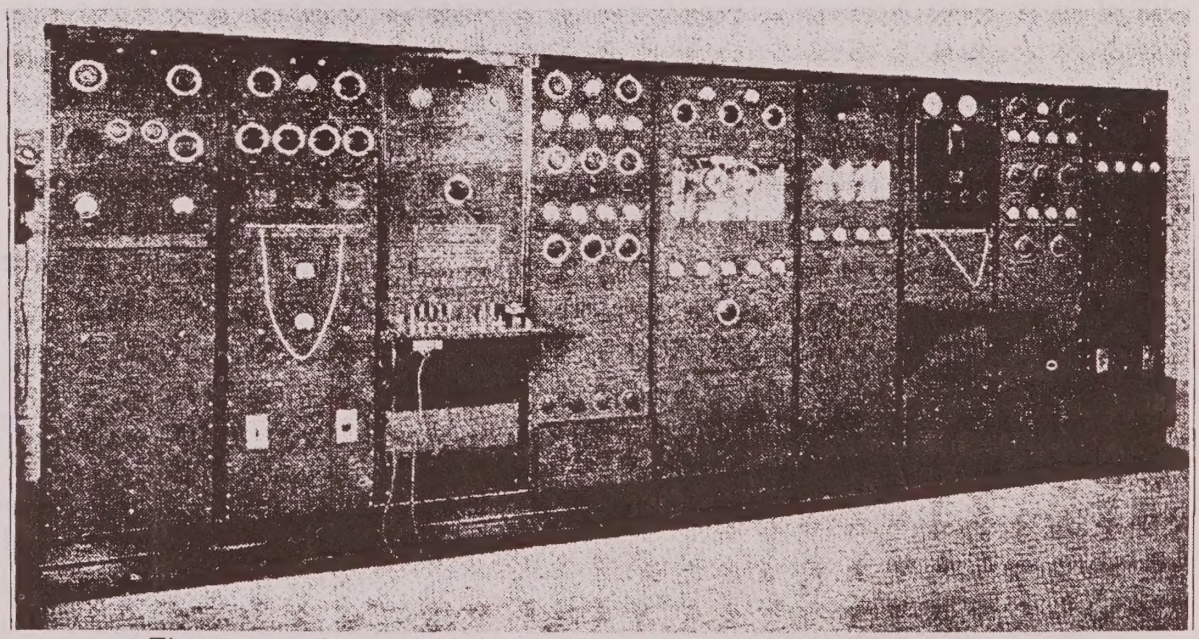
Considering Eimac's early alignment with the amateur-radio community, it is of interest to cite some specific buyers of Eimac tubes from this group. Here are some "big DX men" and other figures of importance. There seem to have been quite a number of "California kilowatt" transmitters using Eimac products.

Don Wallace, W6AM. A major power in DX competition, celebrated in the 1991 book Don C. Wallace, W6AM, Amateur Radio's Pioneer. Known purchases in 1936-39: 3-VC, 2-100T, 1-150T, 2-250T, 3-300T, 1-450T

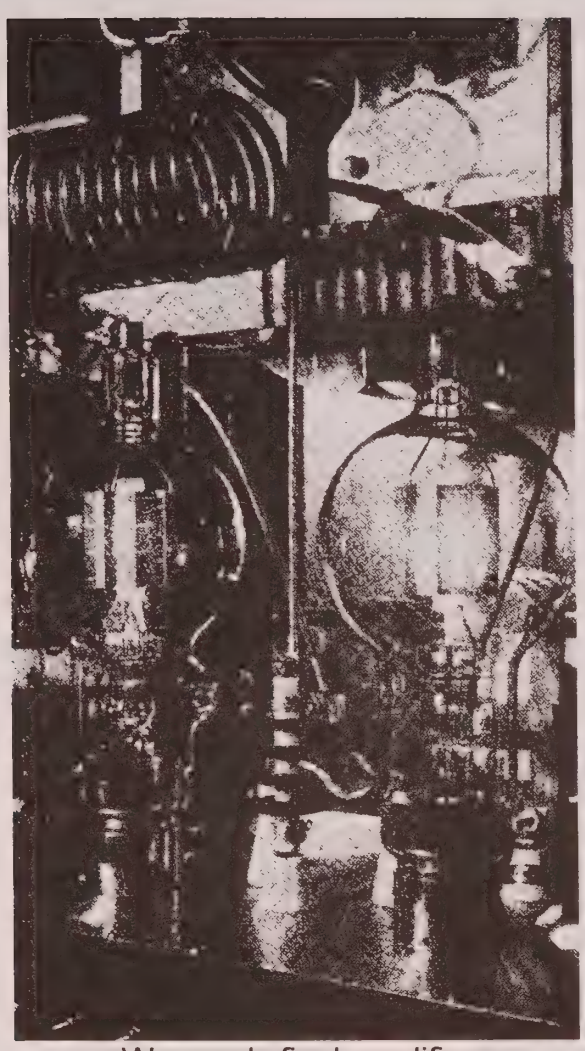
D. Reginald Tibbetts, W6ITH, developer of a system of 5-meter portable radiophones that expedited construction of the San Francisco - Oakland Bay Bridge, he built a massive station outside Berkeley. Known purchases in 1936-39: 2-VC, 2-50T, 13-100T, 1-150T, 4-300T, 2-500T.

Herb Becker, W6QD, DX editor of *Radio* and later sales agent for Eimac in Southern California. Known purchase in 1937: 2-100T.

Jo Emmett Jennings, W6EI, Eimac employee, later founder of Jennings Radio, which made vacuum capacitors, vac-



Five transmitters at W6ITH. The "1000-watt" unit in the center, with the large window, uses two 500Ts. *Photo:* Radio, *March 1936*



Woerner's final amplifier

Photo: Radio, *Feb. 1940.*

uum relays, and even a few 100Ts. Known purchases in 1938-41: 2-VC, 4-100T, 4-250T

John Woerner, W6ONQ, Eimac employee and operator at W6USA, the station on Treasure Island during the 1939 Golden Gate Exposition. Known purchase in 1939: 2-450T.

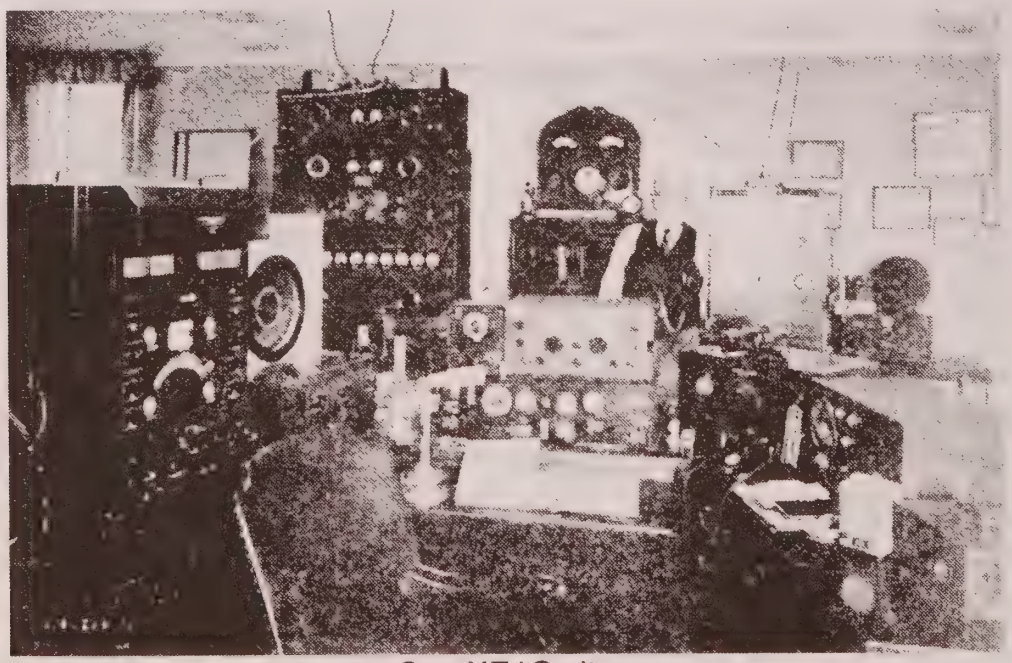
Katashi Nose, KH6IJ, engineering professor at the University of Hawaii, *QST* author, and later pioneer in transpacific 2-meter contacts. Known purchase in 1940: a 100T.

Oswald Villard, W6QYT, engineering professor later best known for having popularized single-sideband transmission. Known purchase in 1939: a 100T.

Carman "Randy" Runyon, W2AG, past vice president of the Radio Club of America, provider of the site at Yonkers, NY for Major Armstrong's first FM field demonstration, and board chairman at REL. Known purchases in 1937-38: 6-250Ts.

Frank S. McCullough, W5BHU, author in *Radio*. Known purchases in 1937: 2-100T

Dr. Jos. B. Hard, XE1G, possessor of massive stations at his two residences. Known purchases in 1936-40: 4-150T, 3-250T.



One XE1G site.

Photo: Radio, *May 1937.*

SELECTED COMMERCIAL PURCHASERS

Some "buys" by equipment makers are of particular interest. Here is a sampling.

RME (Radio Manufacturing Engineers) of Peoria, IL, bought in 1936-38 8-100T, and 8-250T. This firm was known as a maker of communication receivers. However, this purchase makes sense in light of their decision to develop a 1-kW amateur transmitter. Two prototypes were built, but the 1938 recession led to cancellation of the project. One of the transmitters is reported to have become the personal set of Russell Planck, W9RHG, RME's proprietor. It has survived in a radio collection.

Advertising logo, 1937

The **National Company** acquired, between 1937 and 1940, 10-100T. National, mainly a receiver manufacturer, introduced a 600-watt transmitter quasi-kit in late 1938. It used a 35T driving 100Ts. It did not sell well, and was dropped early.

Collins Radio bought three 250Ts in 1938. Then, in 1940 they took on 55-450TH and 16-750T.

The **Federal Telegraph Co**. (later Federal Telephone & Radio) was a tubemaker in its own right. However, in 1938-39 it bought 23-100T, 27-250T, and 10-450T.

The **Fred M. Link Co.**, an early maker of FM mobile radios and base stations, was an enthusiastic user of Eimac tubes. In 1937-41 their purchases were 63-100T, 80-250T, 28-450T, and 1-1000UHF.

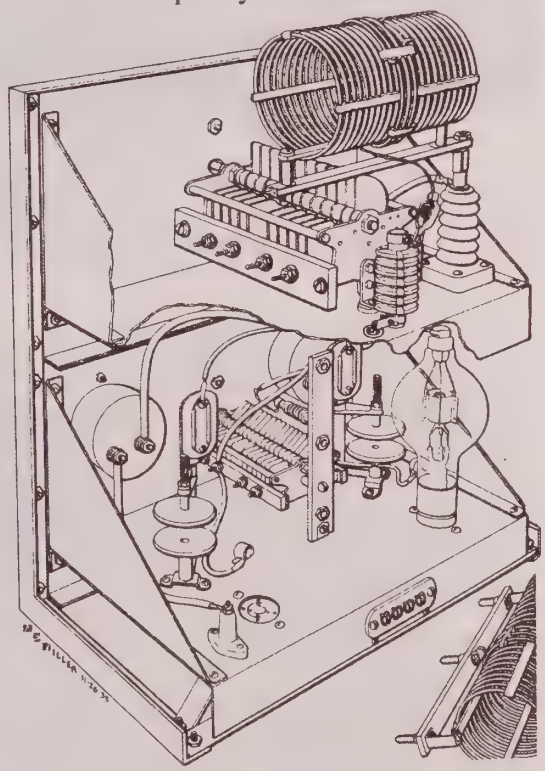
The **Gates Radio Co**. is perhaps most remembered for AM broadcast transmitters using 833As. However, in 1938-40 they absorbed 14-100T and 8-250T.

Hallicrafters, in developing its HT-4 450-watt amateur transmitter, used a Raytheon RK-63 modulated by RK-38s. It was announced in late 1938. However, the company bought numerous Eimac products in 1939-40: 10-100T and 13-250T. When the HT-4 became the Signal Corps BC-610 ca. 1941, the tube lineup changed to a 250T modulated by 100Ts.

REL, besides buying the very large tubes listed later, used many of the smaller ones. In 1937-40 their purchases were 47-100T, 133-250T, 5-450T, and 27-500T.

TEMCO (Transmitter Equipment Manufacturing Co.) acquired, in 1939-40, 8-VC, 19-100T, and 22-250T.

Wunderlich Radio of San Francisco, builder of the K6USA transmitter for the 1939 Exposition, bought in 1939-40, 5-100T and 4-250T. George Wunderlich, W6DUW, joined Eimac soon afterward in an executive capacity.



500-watt amplifier using 50Ts
Image: Radio, *Jan. 1936.*

SALES OF THE BIG TUBES

The larger Eimac glass triodes are rare collectibles today. This is no surprise: sales were tiny compared to those of, say, 250Ts. The 1500T and 2000T were officially introduced in June 1939, although sales had begun in April. They remained in the catalog until at least 1974, although obsolete. Here is a breakdown of sales of tubes in the 750-watts-and-up-class, logged between May 1938 and March 1941. Some of the buyers' names are a bit cryptic today; others are still familiar.

BUYER	750TL	1000UHF*	1500T	2000T
Adolf Schwartz	5			
Major Armstrong	7	3		
Bendix	11			
Bluff City Dist.			3	
Braniff	6			
CAA	19			
Collins	16			
Farnsworth		4		
Frazar (export)	55	4	15	2
Galvin	1			
H. Jappe (distributor)	4		6	
Iowa Broadcasting			1	
Link Radio		2		
M & H Sporting Goods	2			
Newark Electronics	4			
Philco			3	
Press Wireless	5	7	4	3
Radio Electric Service	5			
Radio Parts		2		
Radio Shack	2			
Radio Telephone	54	3		
REL	16		12	4
Southwest Radio	3			
Standard Radio		5		
Tech Equipment	1			
Terminal Radio	10			
TWA	4			
Unidentified (8-39)				2
WGN	1			
Wilkinson	2			
Yankee Network			2	
Zenith	3	12		

* Redesignated 1000T in 1943.

EIMAC ADS IN *ELECTRONICS*

(Some of these also appeared in the corresponding issues of *Proceedings of the I. R. E.*)

5-37 (1/3 p.). Announces 450TH-TL priced at $75. Ad was pointed toward broadcasters, although the real market for this tube developed as a communications tube and modulator in the SCR-270/271 radars. RCA some months later announced the 833 at $85 - an inferior deal in terms of dissipation- per-dollar.

11-38 (1 p.). Depicts 4-kW, five~channel ground-to-air transmitter built by Siebenthaler to specs of Eastern Airlines and TWA. Five final amps. with two 450TLs each.

12-38 (1 p.). Shows 2-kW FM transmitter built by REL for Major Armstrong, with two 750TL triplers into dual 750TLs. (This became the driver for the 40-kW, dual-899s power amp. at W2XMN.)

1-39 (1 p.). Promotes the 1000UHF for use up to 100 MHz.

2-39 (1 p.). Pictures 1-kW, 30-45 MHz AM radio-facsimile transmitter made by Link Radio for Finch Telecomm. Corp. Uses 250TH driver into P-P 450TH final, modulated by two 250THs.

3-39 (2/3 p.). Advertises vacuum capacitors (6, 12, 25, and 50 pF). Shows 1-kW four- channel final amp built by Wunderlich Radio, using dual 250Ts and four caps.

4-39 (2/3 p.). Vacuum capacitors again.

5-39 (2/3 p.). Depicts developmental trailer~mounted instrument-landing localizer by Air-Track Mfg. Co. Set produces 400 W at 125 MHz with UH51 doubler feeding two 100TH drivers into two 250THs.

6-39 (1 p.). Announces 1500T and 2000T, at $225 and $300 respectively.

7-39 (1/3 p.). Promotes 250T at $24.50 list.

8-39 (1/3 p.). Testimonial from Alameda County Sheriff re 10,000-hr life on 250Ts.

9-39 (2/3 p.). Shows 250T in Link police set at KQBH, Kansas City; 500 watts on 33.1 MHz.

10-39 (2/3 p.). Depicts REL-built Yankee Network FM transmitters at WEOD (Boston) and W1XOJ (Paxton, MA) using 1500T finals.

11-39 (2/3 p.). Testimonial letter from KONO, San Antonio, TX. "Composite" transmitter uses P-P-parallel 250TLs as Class A modulator.

12-39 (2/3 p.). Promotional for 450T.

1-40 (1 p.). Shows 3-kW Collins transmitter used by Braniff Airways at Kansas City and Dallas: dual 750TLs in final amp., modulated by two 450TLs. Testimonial letter reports that, after six months' use, the airline had gotten FCC approval to uprate the set to 5 kW.

2-40 (2/3 p.). Depicts multichannel Collins transmitter used by American Airlines, with 450TLs modulated by 450TLs in Class B.

3-40 (2/3 p.). Pictures massive 11-channel, 11-PA transmitter built by Wilcox Electric Co. for Eastern Air Lines. Each final amp. uses dual 450TLs; shared modulators are also 450TLs. 26 450TLs in each station!

4-40 (2/3 p.). "FM is here." Promotes 250T, 450T; 1500T, and 2000T for broadcasting.

5-40 (2/3 p.). Promotes new dual-unit 152TL and quad-unit 304TL as multiple sets of 75T elements.

6-40 (1 p.). Testimonial from Transcontinental & Western Air, Inc. re 10,000-hr life of 450TLs in Siebenthaler ground transmitters. Five stations in service, building five more; planning another five.

7-40 (2/3 p.). Features 1500T in use at W8XVB, Stromberg-Carlson FM, Rochester.

8-40 (1 p.). Celebrates "most powerful aircraft ground station in the U. S. A.," a 5-kW set built by Federal Telegraph Co. for United Air Lines; first of 11 new stations. Four 450Ts in each channel.

9-40 (1 p.). Plugs ten Link-built VHF-FM base-station transmitters in the new Connecticut State Police FM network. Final amps. are 250Ts.

10-40 (1 p.). Subject is Zenith's 1-kW W9XZR. Transmitter uses 35Ts driving 152TLs into dual 1500Ts. Grid and plate fittings on the 1500Ts are water-cooled.

11-40 (1 p.). Another "1500T" FM station: W9XAO, the *Milwaukee Journal.*

12-40 (1 p.). 'The Parade of Leaders in FM" - collective promotion based on stations previously featured.

1-41 (1 p.). Focuses on the 450T; plugs it as used in ground stations for "practically every major airline"; claims "throughout the world hundreds of police radios and thousands" [!] "of commercial transmitters requiring 1 kW to 5 kW output find the Eimac 450T vastly superior to most other tubes of like ratings."

3-41 (1 p.). General promotion for the whole Eimac line.